

**DT-6687**

**TOOL HOLDER FOR ANNULAR CORE BIT**

## **BACKGROUND OF THE INVENTION**

### **1. Field of the Invention**

The present invention relates to a tool holder for a drilling tool and, in particular, for an annular core bit.

### **2. Description of the Prior Art**

Tool holder for conventional annular core bits with an inner thread, *e.g.*, 1 $\frac{1}{4}$ " UNC or PIXIE, has a bit-side axial stop surface for axially supporting the core bit. A drawback of such releasable thread connections, *e.g.*, according to U.S. Patent No. 4,911,253, consists in laborious mounting of the core bit on the tool holder and its dismounting therefrom. Also, often, jamming of the thread connection occurs.

German Publication DE-37 44 091 discloses a tool holder for an annular core bit which permits quick mounting and dismounting of the core bit. The tool holder has an inner splined profile and two inner conical surfaces. The associated shanks of the annular core bits lead to an axial lengthening of the entire tool-holder-shank system.

U.S. Patent No. 4,923,344 discloses a tool holder for quick mounting and dismounting an annular core bit having a special screw-in adapter with an outer

thread provided at its bit-side end, and a short shank. The tool holder has a spline toothing for transmitting a torque, a hollow, freely rotatable flange with an inner thread for an axial locking, with coaxial displacement of the bit being effected exclusively via small axial annular end surfaces. Because of a relatively small distance between the annular end surfaces, the yield limits, which characterize a plastic deformation-free state, are also small. With annular core bits having large diameters, above 100mm, the bending torques, which are generated during the use of the core bits, exceed those yield limits.

An object of the present invention is a tool holder for quick mounting and dismounting of annular core bit having a short shank and a large diameter.

Another object of the present invention is a shank for an annular core bit.

A further object of the present invention is to provide appropriate adapters for at least one of tool holders and shanks.

### **SUMMARY OF THE INVENTION**

This and other objects of the present invention, which will become apparent hereinafter, are achieved by providing a tool holder having a guide member provided at a bit-side end of the tool holder, a hollow, freely rotatable flange

arranged coaxially with the guide member for axially locking same and having an inner thread, an outer cone surface located inwardly of the guide member and axially spaced therefrom, the outer cone surface tapering toward the bit-side end of the tool holder, and torque transmitting means arranged between the guide member and the outer cone surface.

The provision of an outer cone surface spaced from the guide member permitted to provide a tool holder for quick mounting and dismounting of an annular core bit with a short shank, which is capable to withstand high bending torques without exceeding the yield limits of the guide member or the outer cone surface.

Advantageously, the guide member has an inner cylindrical surface. Thereby, with a circumferential even contact, an axial degree of freedom is obtained, which is useful during locking of the guide member.

Advantageously, the outer cone surface tapers toward the bit-side end of the tool holder at a cone angle from  $10^\circ$  to  $15^\circ$ , preferably, at a cone angle of  $12.5^\circ$ . This, in addition to providing a second even contact, insures a jam-free frictional locking.

Advantageously, an axial center of the guide member is spaced from an axial center of the outer cone surface by a distance amounting to from 25mm to 50mm, preferably by a distance of about 35mm. With the diameter of the guide member of 24.5mm and the mean diameter of the outer cone surface of 38mm in the axial center of the outer cone surface, the obtained diagonal is maximized with respect to the bending torque.

Advantageously, the torsion transmitting means is formed as a channel toothed, which can be formed relatively easy, in particular, by extrusion.

Advantageously the inner thread of the flange is formed as a round thread, preferably as a left-hand round thread with a diameter of 55mm. This permits to achieve a substantially soiling-free connection with a conventional bit subjected to a right-hand rotation.

Advantageously, the tool holder is formed as a hollow part. This provides for connection of the tool holder with a likewise hollow drive shaft through which a flushing fluid is fed into the interior of the annular core bit.

Advantageously, the tool holder is formed as an easily removable adapter, which permits it to be used in power tools with specific chucks.

Advantageously, the adapter has two, axially spaced, outer cone surfaces tapering inwardly from the bit-side end of the tool holder, and an axial spline shaft portion located between the outer cone surfaces. This permits to use the tool holder-adapter with standard chucks.

An annular core bit shank, which cooperates with the inventive tool holder, has a guide member provided at bit-side end of the shank a flange arranged coaxially with the guide member for axially locking same and having an outer thread, an inner cone surface located inwardly of the guide member and axially spaced therefrom, the inner cone surface tapering toward the bit-side end of the shank, and torque transmitting means arranged between the guide member and the inner cone surface.

Advantageously, the guide member has an inner cylindrical surface. Thereby, with a circumferential even contact, an axial degree of freedom is obtained, which is useful during locking of the guide member.

Advantageously, the inner cone surface tapers toward the bit-side end of the shank at a cone angle from  $10^\circ$  to  $15^\circ$ , preferably at a cone angle of  $12.5^\circ$ . This, in addition to providing a second even contact, insures a jam-free frictional locking.

Advantageously, an axial center of the guide member is spaced from an axial center of the inner cone surface by a distance amounting to from 25mm to 50mm, preferably, by a distance of about 35mm. With the diameter of the guide member 24.5mm and the means diameter of the inner cone surface of 38mm in the axial center of the inner cone surface, the obtained diagonal is maximized with respect to the bending torque.

Advantageously, the torsion transmitting means is formed as a channel toothed, which can be formed relatively easy, in particular, by extrusion.

Advantageously the inner thread of the flange is formed as a round thread, preferably as a left-hand round thread with a diameter of 55 mm high locking forces. This permits to achieve high locking forces.

Advantageously, the shank is formed as a hollow part, which insures feeding of a flushing medium into the interior of the annular core bit.

Advantageously, the shank of the annular core bit is formed as a removable adapter, which makes it possible to use it with an annular core bit having a specific shank.

Advantageously, the adapter is provided with an outer thread, e.g., a M41 x 2 thread, which permits to use it with standard annular core bits.

The novel features of the present invention, which are considered as characteristic for the invention, are set forth in the appended claims. The invention itself, however, both as to its construction and its mode of operation, together with additional advantages and objects thereof, will be best understood from the following detailed description of preferred embodiment, when read with reference to the accompanying drawings.

**BRIEF DESCRIPTION OF THE DRAWINGS:**

The drawings show:

Fig. 1 a partially cross-sectional view of a system tool holder-shank of an annular core bit; and

Fig. 2 a partially cross-sectional view of a system tool holder adapter-shank adapter.

## **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

A tool holder 1 according to the present invention for quick mounting and dismounting of an annular core bit 2 and which is shown in Fig. 1, includes a hollow, freely rotatable flange 3 for axially locking, along an axis A a guide member 4 which is arranged at a bit-side end of the tool holder 1 coaxially with the flange 3 and has a cylindrical outer surface. The flange 3 has an inner thread 17 which is formed as a left-hand round thread. The tool holder 1 further includes an outer cone surface 6 axially spaced from the guide member 4 and tapering toward the bit-side end of the tool holder 1 at a cone angle  $\alpha$  of from  $10^\circ$  to  $15^\circ$ , preferably,  $12.5^\circ$ , and torque transmitting means 5 which is arranged between the guide member 4 and the outer cone surface 6 and is formed as channel toothing. The tool holder 1, which is formed as a hollow member, has a female thread (not shown) with which it is mounted on a rotatable hollow drive shaft 7 for joint rotation therewith.

The tool holder is designed, as it has been mentioned above, for mounting the annular core bit 2 having a shank 8 that is formed as a hollow member and is soldered in the annular core bit 2. The shank 8, which is formed as a complementary to the tool holder 1, part, has a flange 9 with an outer thread and is

designed for axially locking and locking of a guide element 4' provided at the bit-side end of the shank 8 and having an inner cylindrical surface. The shank 8 further includes an inner cone surface 10 axially spaced from the guide element 4' and tapering toward the bit-side end of the shank, and torque transmitting means 5' which is arranged between the guide element 4' and the inner cone surface 10 and is formed as channel toothing. The cone angle  $\alpha$  amounts to from  $10^\circ$  to  $15^\circ$ , preferably  $12.5^\circ$ , and is equal to the cone angle of the outer cone surface 6 of the tool holder 1. The axial distance X between the axial center of the guide element 4' which has, e.g., a diameter of 24.5mm, and the axial center of the inner cone surface 10 which is defined by a mean diameter of 38mm, is equal to the axial distance between the axial center of the guide member 4 and the axial center of the outer cone surface 6 and amounts to 35mm. The outer thread 18 of the flange 9 of the shank 8 is formed, as the inner thread 17 of the flange 3 of the tool holder 1, as a left-hand round thread and has a diameter, e.g., of 55mm.

As shown in Fig. 2, the tool holder 1 is formed as a specific tool holder adapter 11 that cooperates with a holding element 1' of a rotatable hollow drive shaft 7'. The tool holder adapter 11 has two, axially spaced from each other outer cone surfaces 12a, 12b tapering in a power tool-side direction, and an axially

extending splined shaft portion 13 extending between the outer cone surfaces 12 a and 12b.

The shank 8 can be formed as a shank adapter 14 provided, at its bit-side, with an outer thread 15, e.g. M41x2 thread, that cooperates with an inner thread 16, likewise M41x2 thread, of the annular core bit 2.

Though the present invention was shown and described with references to the preferred embodiment such are merely illustrative of the present invention and is not to be construed as a limitation thereof and various modifications of the present invention will be apparent to those skilled in the art. It is, therefore, not intended that the present invention be limited to the disclosed embodiment or details thereof, and the present invention includes all variations and/or alternative embodiments within the spirit and scope of the present invention as defined by the appended claims.